

EXERCISES

For more practice, see *Extra Practice*.

Practice and Problem Solving

A Practice by Example

Example 1 (page 17)

Sketch each of the following.

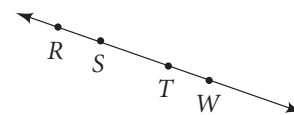
1. \overline{AB}

2. \overrightarrow{AB}

3. \overleftrightarrow{BA}

4. \overleftrightarrow{BA}

Use the figure at the right for Exercises 5–10.



Exercises 5–10

5. Name all the labeled segments.
6. Name all the labeled rays.
7. a. Name a pair of opposite rays with T as an endpoint.
b. Name another pair of opposite rays.

Copy the line pictured above. On your copy mark a different point, Y . How many of each type of figure are there with Y as an endpoint? Name them.

8. segments
9. rays
10. **Critical Thinking** Are there any new rays you can name (see Exercise 6) using R, S, T , or W as the endpoint and Y as the second point? If yes, name them.

Example 2 (page 18)

In the diagram, name all segments shown that are parallel to the given segment.

11. \overline{AC}

12. \overline{EF}

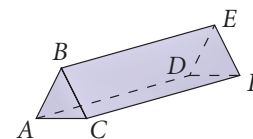
13. \overline{AD}

In the diagram, name all segments shown that are skew to the given segment.

14. \overline{AC}

15. \overline{EF}

16. \overline{AD}



Exercises 11–20

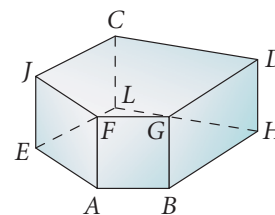
Example 3 (page 19)

Use the diagram above and name a pair of figures to match each description.

17. parallel planes
18. parallel lines
19. skew lines
20. a line and a plane that are parallel

Use the figure at the right to name the following.

21. all lines that are parallel to \overleftrightarrow{AB}
22. two lines that are skew to \overleftrightarrow{EJ}
23. all lines that are parallel to plane $JFAE$
24. the intersection of plane FAB and plane FAE



B Apply Your Skills

In Exercises 25–32, describe the statement as true or false. If *false*, explain.

25. $\overleftrightarrow{CB} \parallel \overleftrightarrow{HG}$

26. $\overleftrightarrow{ED} \parallel \overleftrightarrow{HG}$

27. plane $AED \parallel$ plane FGH

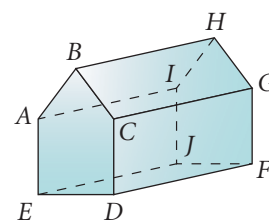
28. plane $ABH \parallel$ plane CDF

29. \overleftrightarrow{AB} and \overleftrightarrow{HG} are skew lines.

31. \overleftrightarrow{CG} and \overleftrightarrow{AI} are skew lines.

30. \overleftrightarrow{AE} and \overleftrightarrow{BC} are skew lines.

32. \overleftrightarrow{CF} and \overleftrightarrow{AJ} are skew lines.



Are the two figures the same? Explain.

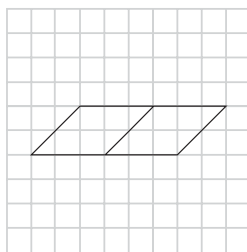
33. \overleftrightarrow{XY} and \overleftrightarrow{YX}

34. \overleftrightarrow{XY} and \overleftrightarrow{YX}

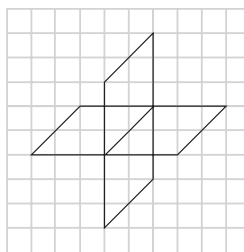
35. \overleftrightarrow{XY} and \overleftrightarrow{YX}

36. The following steps show how to draw planes A and B intersecting in \overleftrightarrow{FG} .

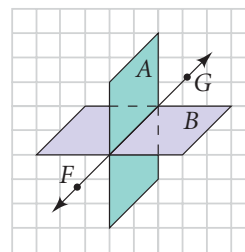
Step 1



Step 2



Step 3



Use similar steps to draw plane DFE and plane DFJ intersecting in \overleftrightarrow{DF} .



Reading Math

"Always," "sometimes," and "never" refer to all possible cases, not to intervals of time.

Complete Exercises 37–47 with *always*, *sometimes*, or *never* to make a true statement.

37. Two parallel lines are ? coplanar.

38. Two skew lines are ? coplanar.

39. Two opposite rays ? form a line.

40. \overleftrightarrow{TQ} and \overleftrightarrow{QT} are ? the same line.

41. \overleftrightarrow{GH} and \overleftrightarrow{HG} are ? the same ray.

42. \overleftrightarrow{JK} and \overleftrightarrow{JL} are ? the same ray.

43. \overleftrightarrow{AX} and \overleftrightarrow{XA} are ? the same segment.

44. Two lines in the same plane are ? parallel.

45. Two planes that do not intersect are ? parallel.

46. Two lines that lie in parallel planes are ? parallel.

47. Two lines in intersecting planes are ? skew.

48. **Coordinate Geometry** \overleftrightarrow{AB} has endpoint $A(2, 3)$ and contains $B(4, 6)$.

Give possible coordinates for point C so that \overleftrightarrow{AB} and \overleftrightarrow{AC} are opposite rays. Graph your answer.

49. **Directional Compass** On a directional compass, the directions north and south can be represented by opposite rays.
- Name two other compass directions that can be represented by opposite rays.
 - What other pairs of opposite directions, if any, can you find?

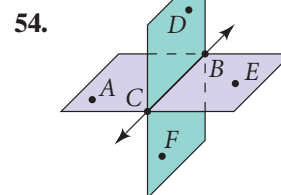
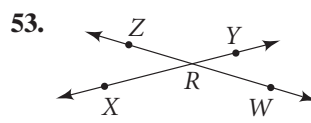
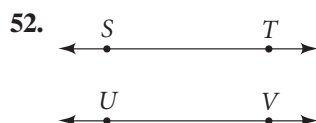


50. **Open-Ended** Summarize the three ways in which two lines may be related. Give examples from the real world that illustrate the relationships.



51. **Writing** The term *skew* is a Middle English word meaning “to escape.” Explain how this meaning might be appropriate for skew lines.

Describe each figure using geometric terms.



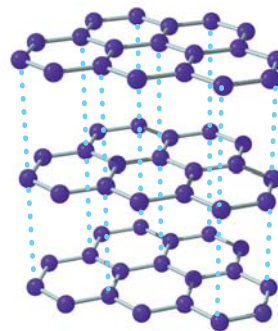
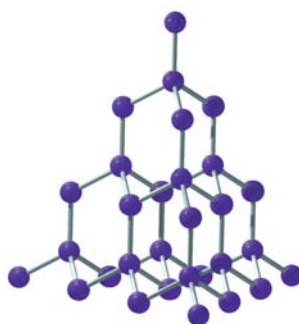
55. **Critical Thinking** Suppose two parallel planes A and B are each intersected by a third plane C .
- Make a conjecture about the intersection of planes A and C and the intersection of planes B and C .
 - Find examples in your classroom.



Challenge



56. **Chemistry** In diamond, each carbon atom bonds to four other carbon atoms in a three-dimensional network. In graphite, each carbon atom bonds to three carbon atoms in the same plane. The “sheets” or planes of graphite are parallel. Find out how these structures affect the properties of diamond and graphite.

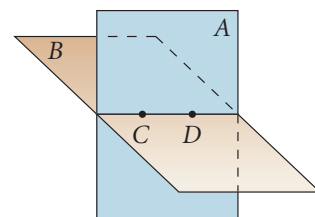


57.
 - Draw a line. Draw points E and F on the line. How many different segments do points E and F determine? Name the segments.
 - Draw another line. Draw points E , F , and G on the line. How many segments do points E , F , and G determine? Name them.
 - Continue to draw lines, labeling one more point each time. Make a table showing the number of points and the number of segments determined. Look for and describe a pattern in the data.
 - Use your pattern to find how many segments are determined if you label 10 points on a line.
 - If you label n points on a line, how many segments can you name?

Use the figure at the right for Exercises 58 and 59.

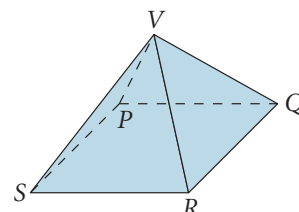
58. Do planes A and B have other lines in common that are parallel to \overleftrightarrow{CD} ? Explain.

59. **Visualization** Are there planes that intersect planes A and B in lines parallel to \overleftrightarrow{CD} ? Draw a sketch to support your answer.



The figure at the right is a pyramid.

60. Name three lines that intersect at one point.
61. What line could be parallel to \overleftrightarrow{PS} ?
62. **Visualization** Consider a plane through V that is parallel to plane $PQRS$. Can a line in that plane be parallel to \overleftrightarrow{SR} ? Can it intersect \overleftrightarrow{SR} ? Can it be skew to \overleftrightarrow{SR} ? Explain each answer.



Standardized Test Prep

Multiple Choice

Use the figure at the right for Exercises 63–65.



63. How many labeled segments are in the figure?
 A. 1 B. 4 C. 6 D. 10
64. Which ray is opposite \overrightarrow{BC} ?
 F. \overrightarrow{BE} G. \overrightarrow{BD} H. \overrightarrow{BA} I. \overrightarrow{AB}
65. What is another name for \overrightarrow{CA} ?
 A. \overrightarrow{AC} B. \overrightarrow{CB} C. \overrightarrow{CE} D. \overrightarrow{DC}
66. Which figure could be the intersection of two planes?
 F. line G. ray H. point I. segment

Quantitative Comparison

Compare the boxed quantity in Column A with the boxed quantity in Column B. Choose the best answer.

- A. The quantity in Column A is greater.
 B. The quantity in Column B is greater.
 C. The two quantities are equal.
 D. The relationship cannot be determined from the information given.

Column A

Column B

- | | | |
|-----|--|--|
| 67. | the next number in the sequence
1, 3, 5, 7, ... | the next number in the sequence
2, -4, 6, -8, ... |
| 68. | the number of lines
determined by two points | the number of points
determined by two
intersecting lines |
| 69. | the number of segments that can
be named using points A , B , and C | the number of lines determined
by three points, A , B , and C |



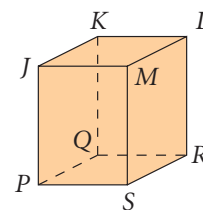
Take It to the NET

Online lesson quiz at
www.PHSchool.com

Web Code: afa-0103

Short Response

70. a. Use the diagram to explain how parallel lines and skew lines are alike and how parallel lines and skew lines are different.
 b. Does the diagram suggest other lines that are parallel to \overleftrightarrow{JM} , besides \overleftrightarrow{KL} , \overleftrightarrow{QR} , and \overleftrightarrow{PS} ? Explain.

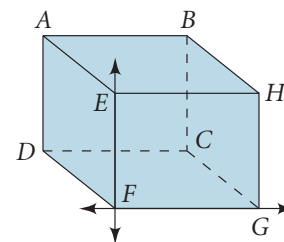


Mixed Review

Lesson 1-2

Use the diagram for Exercises 71–78 and name each geometric figure.

71. a line 72. a point
 73. the intersection of \overleftrightarrow{DC} and \overleftrightarrow{CG}
 74. two planes that intersect in \overleftrightarrow{EF}
 75. the plane represented by the top of the box
 76. the plane represented by the front of the box
 77. the intersection of planes EFG and DFG
 78. another point in plane CGH



Draw the following.

79. \overleftrightarrow{TR} 80. \overline{PQ} 81. \overrightarrow{NV}

Lesson 1-1

Find the next two terms in each sequence.

82. 1, 1.08, 1.16, 1.24, 1.32, ... 83. -1, -2, -4, -7, -11, -16, ...
 84. AB, BC, CD, DE, EF, ... 85. A, D, G, J, M, ...
 86. **Reasoning** Raven conjectured: "If you subtract a number from a given number, the result is always less than the given number." Is her conjecture true? Explain.